

What is claimed is:

1. A system for stimulating nerves for conducting nerve research, investigations and/or treatments, said system comprising:
  - A) a diode laser configured to generate pulses of infrared light,
  - B) a laser controller for controlling said diode laser to produce laser pulses of desired duration and power to produce a desired pulse power profile,
  - C) a beam control optical system for directing a portion or all of said pulses to infrared light to a target comprising at least one nerve or a portion of at least one nerve so as to produce single mode stimulation of nerve fibers.
4. The system as in Claim 1 wherein said infrared light is infrared light at wavelengths of about 980 nm.
5. The system as in Claim 1 wherein infrared light is infrared light having an absorption coefficient in skin within a range of  $0.25 \text{ cm}^{-1}$  to  $10 \text{ cm}^{-1}$ .
6. The system as in Claim 1 and further comprising an optical fiber with core diameter within the range of 5 to 100 microns.
7. The system as in Claim 1 wherein said nerve fibers are C fiber nociceptors.
8. The system as in Claim 1 wherein said nerve fibers are A-delta fiber nociceptors.
9. The system as in Claim 1 wherein said target comprises an ion channel.
10. The system as in Claim 1 wherein said controller comprises a personal computer.
11. The system as in Claim 1 and further comprising a temperature sensor for sensing temperature of said target.
12. The system as in Claim 9 wherein said temperature sensor is configured to provide a temperature signal to said controller and said controller is programmed to utilize said temperature to provide feedback control of said laser in order to provide a desired temperature profile at said target.

13. The system as in Claim 1 wherein said controller is programmed to provide laser pulsed according to a predetermined pulse energy profile to produce pain but no tissue injury.
14. A process for stimulating nerves for conducting nerve research, investigations and/or treatments, said system comprising:
  - A) generating pulses of infrared light with a diode laser,
  - B) controlling said diode laser to produce laser pulses of desired duration and power to produce a desired pulse power profile,
  - C) directing a portion or all of said pulses to infrared light to a target comprising at least one nerve or a portion of at least one nerve so as to produce single mode stimulation of nerve fibers.
15. The process as in Claim 12 wherein said infrared light is infrared light at wavelengths of about 980 nm.
16. The process as in Claim 12 wherein said nerve fibers are C fiber nociceptors.
17. The process as in Claim 12 wherein said nerve fibers are A-delta fiber nociceptors .
18. The process as in Claim 12 wherein said target comprises an ion channel.
19. The process as in Claim 12 wherein said controller comprises a personal computer.
20. The process as in Claim 12 and further comprising a temperature sensor for sensing temperature of said target.
21. The process as in Claim 18 wherein said temperature sensor is configured to provide a temperature signal to said controller and said controller is programmed to utilize said temperature to provide feedback control of said laser in order to provide a desired temperature profile at said target.
22. The process as in Claim 12 wherein said controller is programmed to provide laser pulsed according to a predetermined pulse energy profile to produce pain but no tissue injury.

23. The process of Claim 12 and further comprising the steps of increasing of power for pulse duration 50-150 ms from power level of 0.5 W with step less than 0.2 W with a diameter of irradiation area 0.5 – 2 mm lead to produce clear monomodal (single) pin prick pain and selective activation of A delta fibers.
24. The process of Claim 12 and further comprising the steps of increasing of pulse duration from 0.3 to 20 sec with power level around 1.5 W with a diameter of irradiation area 5 mm -15 mm lead to inducing of clear monomodal hot pain and selective activation of C nociceptors.
25. The process of Claim 12 and further comprising the steps of: increasing of power for pulse duration of 400-500 ms with a diameter of irradiated area 3-5 mm may induce clear single hot pain or clear single warmth sensation and selective activation of C fibers.